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Title: Role of Soft Templates in the Synthesis of Metal Nanoparticles

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ABSTRACT

The thesis describes the synthesis of metal nanoparticles such as AuNPs, CoNPs, and AgNPs following green route or chemical reduction method, their applications of in catalytic degradation of some hazardous dyes in solution and their antibacterial activities (*in vitro*).

Chapter I deals with brief introduction of nanomaterials, their properties, and various methods for the synthesis of nanomaterials with controlled shape, size and chemical composition, the importance and properties of nanoparticles.

In **Chapter II,** synthesis of Au nanoparticles through chemical reduction methods and their characterization techniques have been discussed. N-(4-hydroxyphenyl) ethanamide (paracetamol) as reducing agent has been used for the reduction and formation of gold–CTA complex which leads to the formation of beautiful nano-flower, branched-leaves, and bird-plume like AuNPs in the range of 40–60 nm.

Chapter III describe the appearance of transient species within the time of mixing of sodium borohydride to a solution of cobalt nitrate, which is stable for some time (10 min). The molar ratios of reactants (Co^{2+}ions and sodium borohydride), presence of stabilizer, ageing of an aqueous $NaBH_4$ solution, mixing order of stabilizers sodium dodecylsulfate, n-hexadecyltrimethylammonium bromide, and poly(vinyl) alcohol and reactants have immense influence on the stabilization of short-lived transient.

In **Chapter IV,** green synthesis of biogenic silver nanomaterials using *Raphanus sativus* extract in presence of two stabilizers, namely, water-soluble starch and cetyltrimethylammonium bromide (CTAB) has been carried out. Effects of stabilizers on the morphology of silver nanoparticles and their antimicrobial activities have been also studied.

Chapter V explored the CTAB capped synthesis of bio-conjugated silver nanoparticles via green route with the aid of *Pithecellobium dulce* pod mesocarp aqueous extract. AgNPs have been found to be very important catalyst for the degradation of methyl orange [MO] and eosin yellow [EY] in presence of $NaBH_4$.